STRESS AND FATIGUE IN THE AVIATION ENVIRONMENT
01 OCT 2009

TERMINAL LEARNING OBJECTIVE

Action:	Reduce the adverse effects of stress and fatigue on individual health, aviation safety, and mission completion
Conditions:	While serving as an Aircrew member
Standards:	In accordance with (IAW) TC 3-04.93, FM 22-51, Flight Stress, Flight Psychology, Fatigue in Aviation, and US Army Aeromedical Policy Letters

ENABLING LEARNING OBJECTIVE A

Action:	Define the term stress
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93 and Flight Stress

1. The generally accepted definition of stress is "**the nonspecific response of the body to any demand placed on it."**

NOTE: Definition established by Hans Selye (1956), a modern researcher of stress. Although this is a broad definition, it brings up several key points:

   a. Stress involves a **physical or body response**

   b. Stress is due to some type of **external or internal demand**

   c. **Stress is neither good nor bad**

   d. Stress causes the individual to adapt in some way

2. It is the individual who defines the stress as good or bad. The same events can have different meanings, and therefore create "different stress," for any 2 individuals

3. Lazarus (1968) researched the "psychological appraisal process". This model suggests that when confronted with a potential stressor, humans simultaneously evaluate the meaning of the event (positive, negative, neutral), the degree of harmfulness associated with the event, and their available coping resources. According to this model, stress is defined as one's perceived threat being greater than the perceived coping abilities. (perceived threat>perceived coping abilities)

ENABLING LEARNING OBJECTIVE B

Action:	Select the signs and symptoms of stress
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93

Physical responses to stress include both immediate symptomatology, and potentially long-term health consequences of unmanaged stress. Immediate physical responses are those involved in the "fight or flight" syndrome and occur automatically

a. **Physical changes include**: increased heart rate, rapid, shallow breathing, increased muscle tension, increased adrenaline, increased perspiration and decreased digestion

b. **Potentially long-term health consequences** are sleeping problems (insomnia), chronic pain, (especially in the neck, upper or lower back, jaw, headaches, etc…), high blood pressure, immune system suppression, fatigue and weight problems

c. **Behavioral signs and symptoms** can include explosiveness (such as increased yelling, physically hitting or punching objects or other people, etc...), poor work performance, withdrawal or social isolation, increased use of alcohol, nicotine or other substances (including over the counter medications and prescribed medications), increased or decreased food intake, increased or decreased sleeping, crying, and suicide attempts or completed suicide

d. **Emotional signs and symptoms** can include irritability, hostility/anger, nervousness, decreased self-esteem, feelings of helplessness, and loss of interest in pleasurable activities

e. **Cognitive signs and symptoms** can include increased worrying, decreased attention, impaired memory, impaired judgment, and poor psychomotor coordination (hand-eye coordination)

ENABLING LEARNING OBJECTIVE C

Action:	Identify types of stressors
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93

1. **Psychosocial stressors** are life events or external events. Examples include marriage, divorce, birth of a child, family problems, death of a family member, friend, unit member, job stress such as increased responsibilities, increased missions, decreased missions, reassignment, or conflict in the unit or among crewmembers, illness or injury to self, family, or close friend

2. **Cognitive stressors** are internal, or the way that you think and approach situations.

NOTE: We can increase our stress by the way we think about situations and events. "Alarming" thoughts tend to do just that, alarm the individual physiologically, emotionally, and/or behaviorally. There are many thought patterns that we fall into that tend to increase stress. Just a few of these thought patterns include the following cognitive "bad habits"

a. **"All or nothing thinking"** is the belief that if you don't have it all, you have nothing. e.g., "if I don't get an award for my work performance, I am a failure", "I didn't get to fly Blackhawks as my first choice, so I will never will fly Blackhawks." There is no "in between" or flexibility in thinking
b. **"Failure to focus on the here and now"** involves distracting oneself from the task at hand by worrying about mistakes of the past or potential problems in the future.

For example, thinking about past missions or going home in the near future will distract a pilot from the current mission

c. **Too many "musts" and "should"** We increase our stress when we expect that events must turn out exactly as we expect. The individual believes there is only one way to do anything, and if things aren't done that way, the person believes he/she is a failure. There is no flexibility in thinking to determine that other options might exist

3. **Physiological stressors**: our ability to cope with stress is impacted by our physical state and health. If our physiological state is impaired, coping techniques may be less effective and less efficient. Some physiological stressors may occur without warning (such as a twisted ankle, a cold, or some other physical ailment) and some may be self-imposed. The following list of self-imposed physiological stressors may lead to maladaptive behaviors that are potentially debilitating and threaten aviation safety. (**DEATH**)

    a. **Drugs:** improper use of these substances can have effects that threaten safety

EXAMPLE: Aspirin and other over-the-counter medications may make the body too relaxed or too tense or they may have unknown effects. Caffeine, if it is overused, can cause stress on the body and brain by over-stimulating each. Prescription medications can have side effects that unexpectedly affect the body. **This is why it's important for the flight surgeon to be aware of all medications a pilot is prescribed**

    b. **Exhaustion**: fatigue has effects on the body and brain that create unsafe situations

    c. **Alcohol**: impairs judgment, thermal stress tolerance, visual acuity, perception, coordination and communication. Can be fatal in large quantities or when operating aircraft or other vehicle or machinery. 12-hour bottle to brief rule (AR 40-8 Temporary Flying Restrictions Due to Exogenous Factors)

    d. **Tobacco:** Nicotine constricts the blood vessels in the body which over time can result in blocked arteries. Nicotine also causes a rapid release of adrenaline which results in a "fight or flight" type physiological response, to include a rapid heartbeat, increased blood pressure, and rapid, shallow breathing. It can also make an aviator hypoxic at lower altitudes than someone who doesn't use nicotine products. Smoking also impairs night vision

    e. **Hypoglycemia**: A proper balanced diet is important to ensure the body receives the nutrients it needs to function in the extreme circumstances in which you might find yourself in the aviation environment. If blood sugar drops too low to provide enough energy for the body's activities, it will affect one's thinking abilities. Symptoms of low blood sugar can include nervousness, shakiness, perspiration, dizziness or light-headedness, sleepiness, confusion, difficulty speaking and feeling anxious or weak

4. **Environmental Stressors**

   a. **Extreme temperatures**. Extreme heat or cold may create physiological stress and cause distraction in the aviation environment, making it difficult to concentrate and attend to multiple tasks. It is important to use proper clothing and equipment for extreme temperatures

   b. **Speed.** Flight involves speeds greater than those experienced in everyday, on-the-ground environments. These speeds require a high degree of alertness and concentration over a prolonged period which can create stress

   c. **Aircraft design**. Human factors engineering items can increase stress and divert pilot attention from operational duties. These engineering items include cockpit illumination, instrument location, accessibility of switches and controls, seat comfort affect aviator performance, heating and ventilating systems, visibility, and noise level

   d. **Airframe characteristics**. Rotary-wing aircraft require constant pilot attention to maintain stability while fixed-wing aircraft have innate stability and can be flown relatively will with minimal pilot attention

   e. **Instrument Flight Conditions**. Poor weather resulting in instrument flight conditions creates stress and increases fatigue. Awareness of greater physical danger and need for increased vigilance can be very stressful

   f. **Altitude**. Aircrew members are subject to problems resulting from trapped gas, which can induce stress due to physical discomfort

ENABLING LEARNING OBJECTIVE D

Action:	Identify the impact of stress on crewmember performance
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93 and Flight Stress

1. Crewmembers rely upon several cognitive abilities to successfully perform their mission
   a. **Psychomotor abilities**, which include hand-eye coordination, muscular coordination, and strength

   b. **Attention** is the cognitive ability to focus a "mental spotlight" on sensory inputs, motor control, memories, or internal representations. It can be allocated to different activities based on perceived importance, or salience

   c. **Memory** is the ability to recall previously learned information. Memory abilities are dependent upon one's memory capacity, memory strategies, and rehearsal, which serve to facilitate the transfer of information from short-term to long-term storage

   d. **Judgment and decision making and prioritization of tasks**

e. **Communication**

2. **Both self-imposed stress and aviation-specific stress have the following effects** on the above noted cognitive abilities of pilots

    a. **Psychomotor abilities decline**. For example, tracking abilities decrease, with a tendency toward more time off-target, over-corrections, and less smooth movements

    b. **Attention abilities** may be compromised during stress in the following ways:

        i. **"Perceptual Tunneling**" is the narrowing of sensory information processed by the brain (i.e. visual field). This can result from both emotional stress and cognitive workload, and can occur in both visual and non-visual sensory channels. For example, a pilot may attend to the most significant stimuli (brightest light, loudest noise) at the expense of other perceptual cues
        ii. **"Cognitive Tunneling"** is the narrowing of what is considered important in the attention field. An example would be a pilot who does not appropriately monitor his airspeed because he is intently focusing on making the proper radio call at the proper time
        iii. **"Task Shedding"** is tunneling carried to the extreme. This is when entire tasks are completely abandoned. For example, tunneling may be missing a radio call while on approach with a caution light illuminated, while task shedding is forgetting to do the pre-landing checks altogether

    c. **Memory abilities** decline in the following manner:

        i. **Overall memory capacity declines** under stress. Whereas the average individual can hold 7 (+/- 2 digits) in memory for a short time, this declines under stress
        ii. Memory strategies are subject to two common errors under stress:

            1) "**Oversimplification"** is the tendency to oversimplify information recalled from memory during the problem-solving or decision-making process
            2) **The "Speed/Accuracy Tradeoff**" is the attempt to maintain the speed of one's responses at the expense of accuracy (most common), or the attempt to maintain the accuracy of one's responses at the expense of speed (experienced pilots)

    d. **Stress also decreases the ability to learn new information**. "Stress Related Regression" is the tendency to forget recent learning and revert to old behaviors under stress. Once information has been learned and is in long-term storage (like driving a car or doing simple arithmetic), it is fairly resilient to stress

    e. **Judgment and decision-making abilities** may be compromised by stress, with inexperienced pilots tending to make a disorganized assessment of alternatives, to rush to a decision, and to seek premature closure

f. **Communication abilities** may be compromised by both the speaker and listener under stress, with changes in speech production, comprehension, and "group think". Group think is the tendency to be more confident of our opinions when they are shared by others, and the tendency to rely on authority figures when there is a perceived threat. This process may impede communication when perceptions differ between group members

ENABLING LEARNING OBJECTIVE E

Action:	Identify the four stress coping methods
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93

1. **Minimize stressors**

    a. **This is the most powerful technique** because it involves preventing your exposure to known stressful events and minimizing the impact of the stressors

    b. **Examples** include good time management, tough realistic training, good problem solving skills, and good nutrition

2. **Practicing good cockpit and crew communication** can prevent miscommunications that could increase stress

    a. Talk and ask questions

    b. Utilize 3-way confirm responses

    c. Brief for lost communications

3. **Change your thinking**

    a. Change thoughts that reinforce a sense of invulnerability, impulsivity, and machismo

    b. Avoid absolutes and perfectionism

    c. Avoid a "pessimistic explanatory style", which is the tendency for one to attribute the negative events of their lives to an internal cause that is both global and stable (i.e. "I am inadequate at everything and I always will be.")

    d. Focus on the here and now

    e. Recognize the choices you make, and increase your sense of personal control

    f. Utilize positive and empowering self-statements

4. **Learn to relax**

    a. The opposite of stress is relaxation. You cannot be stressed and relaxed at the same time, so learn to relax to combat your stress

    b. Utilize deep breathing, in particular diaphragmatic breathing, progressive muscle relaxation, or guided imagery to induce a relaxation response

    c. Don't let a busy schedule crowd out the activities that you normally do to relieve stress (i.e. hobbies)

5. **Ventilate stress**

    a. A regular exercise routine of 30 minutes of aerobic activity three to four times a week has been shown to help prevent stress and combat its effects

    b. Talk it out to gain support and understanding. Talk to professionals to gain insight about problem-solving methods when support from others doesn't ameliorate the stressor. Resources include friends and family members, flight surgeon and aeromedical physician assistant, psychiatrist, psychologist, and social worker, as well as Chaplains and other sources, such as Military One Source

ENABLING LEARNING OBJECTIVE F

Action:	Identify combat and operational stress
Conditions:	Given a list
Standards:	In accordance with Flight Stress and FM 4-02.51

1. Combat and Operational Stress include “all the physiological and emotional stresses encountered as a direct result of the dangers and mission demands of combat” and other operational environments (per FM 4-02.51 “Combat and Operational Stress Control”)

2. Combat and Operational Stress behaviors include a wide range of reactions

    a. **Adaptive Stress Reactions**

        i. Strong personal trust, loyalty, cohesiveness among peers
        ii. Personal trust, loyalty, and cohesiveness between leaders and subordinates
        iii. Esprit de corps or identification with the larger unit
        iv. For aircrews, unit cohesion binds crews together to perform the mission in spite of danger. Crewmembers know and trust their peers and leaders and understand their dependence on each other
        v. Strong sense of responsibility toward the unit and its members

EXAMPLE: Extreme courage; heroic acts, unbelievable strength, self-sacrifice

b. **Maladaptive Stress Reactions** include two categories: Combat and Operational Stress Reaction and Misconduct Stress Behaviors:

i. **Combat and Operational Stress Reactions** may look like symptoms of mental illness, but they are typically transient and resolve within hours or days. Signs and symptoms that may occur include:

- Hyperalertness
- Fear, anxiety
- Irritability
- Self-doubt; loss of confidence
- Inattention; carelessness
- Impaired duty performance
- Erratic actions, outbursts
- Freezing; immobility
- Panic
- Impaired speech or muteness
- Impaired vision, touch, or hearing
- Weakness or paralysis
- Hallucinations, delusions

ii. **Misconduct Stress Behaviors** range from minor breaches of unit orders to serious UCMJ violations and the Law of Land Warfare. Most likely to occur in poorly trained undisciplined Soldiers. However, under extreme combat stress, well-trained Soldiers might also engage in misconduct. Misconduct stress behaviors and criminal acts that might occur include:

- Mutilating enemy dead
- Killing enemy prisoners
- Not taking prisoners
- Killing non-combatants
- Torture, brutality
- Fighting with allies
- Alcohol and drug abuse
- Pillage, Looting, Rape
- Combat refusal
- Self-inflicted wounds
- AWOL; desertion
- Threatening/killing own leaders

ENABLING LEARNING OBJECTIVE G

Action:	Identify how combat stress may affect an aviator
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93

1. **In general, research shows that aviators tend to experience less problematic combat stress than other soldiers**. However, they will still experience a wide range of combat stress reactions that may be problematic or interfere with their ability to function appropriately. Aviators are believed to better cope with combat stress because of the following traits:

    a. **Good group cohesion** and high levels of esprit de corps prior to deployments

    b. **Denial of danger as a coping mechanism**. Pilots and crewmembers are good at focusing on less dangerous aspects of tasks and missions. This works in their favor during deployments

    c. **Identification with the strength of one's aircraft**. Being surrounded by a strong machine decreases one's sense of danger when under attack and makes those within feel less vulnerable and more powerful

2. **A pilot's or crewmember's performance can be degraded** under the following conditions:

    a. **Presence of anti-aircraft weaponry**. When the enemy is well-equipped to damage an aircraft pilots and crewmembers can experience stress overload and their performance can be severely impacted

    b. **High cockpit workload** and task overload. Pilots already have a high amount of tasks and demands to mentally and physically attend to in the cockpit. Having to engage the enemy can create a task overload situation

EXAMPLE: Research shows that when aircrew members are in chemical and/or combat gear while flying, their mood and reaction time to situations declines

ENABLING LEARNING OBJECTIVE H

Action:	Select factors that will decrease one's vulnerability to combat stress
Conditions:	Given a list
Standards:	In accordance with Flight Stress and FM 22-51

Factors that may decrease one's vulnerability to combat stress

a. **Competence in your work**

b. **Confidence in your abilities**

c. **High morale, group cohesion, and esprit de corps**

d. **Control or even perceived control**

NOTE: One of the key ways to decrease problems associated with combat stress is to look out for fellow crewmembers, reassure them when times are difficult, and get them help when you believe they are experiencing difficulty. When deployed in a combat setting, it is common for crewmembers to have unusual, new reactions to stress, or to have a "Normal Reaction to an Abnormal Experience." Often, crewmembers need reassurance that they are not "losing their mind" when they have new stress reactions. They need encouragement and support from peers, leaders, and professionals when necessary, to try different ways to cope with stress and to actively work to manage their stress levels

NOTE: Crewmembers should be encouraged to seek support and/or advice from others, to include medical personnel, mental health, or the chaplain, if they have any concerns or questions about combat stress

ENABLING LEARNING OBJECTIVE I

Action:	Identify long-term stress reactions and treatment issues
Conditions:	Given a list
Standards:	In accordance with FM 22-51 and US Army Aeromedical Policy Letters

NOTE: Stress reactions may persist or arise long after exposure to combat or other operational environments. When these reactions cause disruption in social, academic, or occupational function, a behavioral health professional may need to assess the individual

1. **Signs and symptoms or long-term stress reactions**

    a. "Flashbacks;" painful memories that intrude and affect daily functioning

    b. Trouble sleeping due to bad dreams or nightmares

    c. Guilt about things done or not done in combat or the operational setting

    d. Social isolation, withdrawal, alienation

    e. Hyper-alertness, jumpiness, startle responses

    f. Alcohol or drug abuse/misuse, misconduct

    g. Problems trusting others in social relationships as well as in intimate relationships

CAUTION: Not everyone who experiences a trauma experiences long-term stress reactions. However, if anyone does experience these reactions long after exposure to the traumatic situation, it does **NOT** mean the individual is weak in character, mind, body, or spirit

2. **Combat and Operational Stress treatment issues**

NOTE: It is important for anyone experiencing long-term stress reactions to seek assistance. Combat and operational stress control programs are important to sustain operational strength over the long-term and prevent more serious problems for the Soldiers, their families, and society

a. Aeromedical policy states that crewmembers **CAN** receive treatment for long-term stress reactions without necessarily having it end their flight careers

b. Crewmembers **MAY** be in therapy or counseling and maintain flight status as long as their symptoms are NOT a flight safety issue

c. Crewmembers **CAN** take specific medications for PTSD, depression, and anxiety and maintain flight status. They will receive a temporary grounding. To receive a waiver for the medication they must be at a stable dose for 4 months with no aeromedically-significant symptoms or side effects

NOTE: They key issue for whether or not a crewmember can continue on flight status is safety. Providers will consider safety first, when determining waivers and when a crewmember is fit for flying duties

ENABLING LEARNING OBJECTIVE J

Action:	Define fatigue
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93, and Leader's Guide to Crew Endurance

1. **Fatigue is the state of feeling tired, weary, or sleepy** that results from prolonged mental or physical work, extended periods of anxiety, exposure to harsh environments, or loss of sleep. Although this may sound common sense, fatigue is more than just being tired

    a. **Physiological fatigue**-temporary loss of ability to respond to repeated or continuous stimulation of the muscles. Causes include:
        - Strenuous exercise
        - Sleep loss
        - Noisy or hot environments
        - Inadequate nutrition and fluids
        - Hypoxia
        - Poor physical conditioning
        - Sudden changes in work/rest schedules

    b. **Mental fatigue**-feeling of weariness that results from repetitive performance of nonphysical tasks it can be caused or made worse by anxiety, apprehension, and stress

NOTE: Severity of fatigue can be modified by psychological factors such as the amount of time soldiers expect to be working, the expected difficulty of the work, and the expected reward

ENABLING LEARNING OBJECTIVE K

Action:	Select the signs and symptoms of fatigue
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93, and Leader's Guide to Crew Endurance

Signs and symptoms of fatigue

a. Impaired attention and concentration

b. Feeling or appearing dull and sluggish

c. General attempt to conserve energy by reducing body movements to a minimum

d. Feeling or appearing careless, uncoordinated, confused, and irritable

e. Staring into space. Eye blink frequency will be greatly reduced in aircrew members who are extremely fatigued

f. Increased physical or health complaints, such as headaches, stomachaches, loss of appetite

WARNING: The cognitive deficits are often seen before the physical effects are felt. Therefore, fellow crewmembers may notice an aviator's decreased attention and concentration abilities before the aviator is aware of it

ENABLING LEARNING OBJECTIVE L

Action:	Select the effects of fatigue on performance
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93, Flight Stress and Leader's Guide to Crew Endurance

1. **Reaction time increases, and the quality of motor movements decreases**

    a. Increased errors in timing and accuracy

    b. Not as "smooth" on the controls

    c. Slow and irregular movements

2. **Complete loss of awareness** and failure to respond to any external stimuli due to increased lapses of attention, also known as "micro-sleeps"

    a. **Micro-sleeps may last from 1 to 10 seconds**

    b. **Micro-sleeps increase in frequency and duration** as sleep deprivation increases

3. **Cognitive and Perceptual Tunneling**

    a. **Overall reduced audio-visual scan**

    b. **Inattention to minor, but potentially important, details**

    c. **Memory is diminished**

    d. **Inaccurate recall of operational events**

    e. **Ability to learn new information is compromised**

4. **Overall poor and careless performance in the cockpit**

5. **Greater tolerance for error**

6. **Impairments in communication, cooperation, and crew coordination**

    a. Conversations become more fragmented and repetitive

    b. Misinterpretations occur more easily

    c. Increased potential for error in communicating critical mission, flight, or safety information

ENABLING LEARNING OBJECTIVE M

Action:	Describe the stages of sleep and sleep inertia
Conditions:	Given a list
Standards:	In accordance with Leader's Guide to Crew Endurance

NOTE: Sleep is a biological process that involves mental and physical changes. The result of sleep is physical and mental recuperation. During sleep, changes in brainwaves and physiology occur. Physiological changes include changes in core body temperature, digestion, heart rate, and hormone levels. Tissue repair also occurs during sleep

1. **Sleep is NOT "optional**", although many people act as if it is. It is a biological drive. You cannot survive without it and will have significant health problems if you don't get enough sleep or quality sleep

2. There are 5 stages of sleep, identified by brainwave activity

    a. **Stage 1**: This is the transition between awake and asleep. It lasts about five to ten minutes and you can easily awaken during this stage

    b. **Stage 2**: Stage 2 is a light sleep stage. During this stage eye movement stops, heart rate starts to slow down, and body temperature decreases. The brainwaves begin to slow as well

c. **Stages 3 and 4**: These are the deep sleep stages and also known as "slow wave" sleep because the brain waves are at their slowest. It is difficult to wake people during this stage and if they do awaken they will feel groggy while their brainwaves take time to speed back up

NOTE: Stages 3 and 4 are the most important stages for recovering from fatigue. More time is spent in deep sleep stages earlier in the night. Researchers believe this happens because these stages are more important to our survival. As the night progresses, less time is spent in deep sleep and more time is given to REM sleep

d. **Stage 5**: Rapid Eye Movement (REM), sleep occurs after slow wave sleep. This is the stage in which dreams occur. Brainwaves speed up to be similar to being awake

NOTE: Although researchers are still uncertain of the purpose of REM, it is believed that during this stage we obtain our mental rest and recuperation, and memories are stored. Although not as critical to survival, people need to complete adequate amounts of REM sleep in order to feel fully rested. Without it, people will continue to feel some levels of fatigue and mental performance will be impaired. The average person usually has three to five REM stages per night, with duration being shorter earlier in the night and longer as the night progresses.

NOTE: The average person will make a complete sleep cycle of all 5 stages every 90 minutes. After the first cycle, each subsequent cycle begins with Stage 2

3. **Sleep inertia is the short-term grogginess** experienced right after awaking. Sleep inertia is more intense and lasts longer when you wake up during slow wave sleep. This is because it takes time for the brain to speed up from slow-wave activity to the fast-wave activity that is involved in the awakened state. It can take 20 to 30 minutes to fully recover from sleep inertia and gain a full level of alertness

ENABLING LEARNING OBJECTIVE N

Action:	Identify characteristics of the Circadian Cycle
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93 and Fatigue in Aviation

1. **The Circadian Cycle is an internal "clock" which regulates biological functions, to include alertness**

a. This cycle takes approximately **24 hours** to complete

b. The circadian cycle causes you to be at your **peak level of alertness between 0800 and 1200**

c. **There tends to be a "down time" between 1300 and 1500 when the you tend to be less alert and more drowsy**

2. The circadian cycle needs to be "set" and maintained. **Changes in daily routines and timing of sleep can cause disruption**. Sunrise and Sunset are the strongest cues that set this cycle. Other cues that set it are temperature, meals, and social cues.

NOTE: Regardless of your "normal routine", humans are not biologically programmed to be as alert at night than during daytime hours.

3. **Circadian desynchronosis, or maladaptation, is a disrupted circadian cycle**

    a. **Main causes are shift work and jet lag**

    b. Classic symptoms include fatigue, malaise, sleepiness, lack of motivation, confusion and digestive disorders

ENABLING LEARNING OBJECTIVE O

Action:	Identify specific types of sleep disruptions
Conditions:	Given a list
Standards:	In accordance with Leader's Guide to Crew Endurance

1. **Shift lag**. As aircrew transition from one work schedule to another, desynchronosis is caused by change in sleep/work schedules and the corresponding change in daylight exposure time.

2. **Jet lag**. After travel across time zones, desynchronosis is caused by the rapid change to the light/dark cycle and the new sleep/work schedule in the destination location

3. **Intentional Sleep Restriction** involves decreasing the amount of time spent in sleep by a few hours a night. The symptoms become more problematic and intense the longer it lasts

    a. In many situations, sleep restriction can usually be avoided with time management

    b. Sleep restriction can be unavoidable in an operational environment and necessary due to mission needs.

WARNING: **Even decreasing sleep by one hour per night (7 hours instead of the needed 8 hours) can cause noticeable decreases in attention and performance after 7 days**

4. **Personal Habits**. Poor sleep habits can cause significant disruption in sleep and can lead to fatigue. Engaging in activities that arouse the body or mind soon before bedtime can delay or prevent one from falling asleep.

EXAMPLE: Watching TV in bed, vigorous aerobic activity within 3 hours of bedtime, drinking caffeine before bedtime, studying in bed, and arguing with someone while in the bedroom. These activities lead to the bedroom or sleeping environment being associated with being awake

ENABLING LEARNING OBJECTIVE P

Action:	Identify specific countermeasures for general fatigue and sleep problems
Conditions:	Given a list
Standards:	In accordance with Leader's Guide to Crew Endurance

1. **The best countermeasure for fatigue is prevention**. Get adequate sleep and don't engage in behaviors that disrupt your circadian cycle

2. **Maintain a consistent bedtime/wake-up schedule**. Significant changes in when you go to bed and when you wake up can cause circadian desynchronosis

3. **Use your bedroom for sleep only**. The key is to have your sleeping space associated with sleep, not with other alerting or non relaxing activities. If you are having sleep problems, limit what you are doing in your bedroom

4. **Resolve daily stressors outside of your bedroom**. This countermeasure follows the idea that you need to keep any behaviors you associate with stress out of your sleeping space. Your sleep environment needs to be associated with relaxation. If you engage in stressful activities in your bedroom, the space will soon be associated with stress and induce stress when you enter it

5. **Establish a consistent bedtime routine**. The more consistent you are with your routine, the more it will cue you to become tired. You will go to sleep more quickly and sleep better

6. **Create a quiet and comfortable sleep environment**

7. **Engage in aerobic exercise during the daytime**. Research supports that aerobic exercise during the day helps you fall asleep quicker and stay asleep longer. However, do **NOT** exercise within 3-4 hours of bedtime. This will produce short term alerting affects and interfere with your sleep

8. **Do NOT consume caffeine within 4 hours of bedtime**. Caffeine is a stimulant and will make you more alert

9. **Do NOT smoke cigarettes (or cigars) within 1 hour of bedtime**. Nicotine has alerting properties

10. **Do NOT use alcohol as a sleep aid**. Alcohol greatly disrupts your sleep cycle, specifically your REM sleep. Although alcohol may help you fall asleep, the quality of your sleep is compromised and you can feel fatigued the next day

11. **Do NOT nap during the day** (or non-bedtime)

12. **Avoid watching the clock** when you are trying to sleep. This can cause anxiety and increase your difficulty falling asleep

13. **Do NOT stay in bed if you are having problems falling asleep**. This can cause you to associate being in bed with being stressed and not sleeping. If you aren't going to sleep within approximately 30 minutes, get out of bed and go to another room. Engage in relaxing, non alerting activities. Return to bed when you feel sleepy

ENABLING LEARNING OBJECTIVE Q

Action:	Identify countermeasures for Shift Lag and Jet Lag
Conditions:	Given a list
Standards:	In accordance with TC 3-04.94, Fundamentals of Aerospace Medicine, and Leader's Guide to Crew Endurance

1. **Countermeasures for Shift Lag**

    a. For transition to nighttime work schedule, reduce mental demands and work load between 0400 and 0700 (when possible) for first three days of transition to prevent increased risk due to fatigue and sleepiness. During transition back to day schedule, reduce workload near the end of the work period (after 1500)

    b. Be sure you and your crew double check everything. People are not as alert at night and this can cause an increase in mistakes and accidents

    c. Implement shorter continuous periods at the controls

    d. Minimize administrative duties when on the ground, especially at the end of your shift

    e. After your shift is completed, go home and go to bed. Don't stick around with the next shift

    f. Maximize every sleep opportunity. Be sure you are engaging in good sleep routines and maintaining a good sleep environment

    g. Determine if circadian readjustment is necessary

        i. The general rule is that it takes 1 day to adjust your circadian cycle/alertness by 1 hour. If you will be on the night shift/new shift (or in a new time zone) for only 1-3 days, it is best to try to remain on your original schedule
        ii. If circadian readjustment is necessary, the following can help with your readjustment and alertness/levels of fatigue:
            - Rotate schedules forward when possible, moving from day to evening to night shifts
            - Actively engage in behaviors to readjust quickly
            - Use bright artificial lights when you need to be alert (and it is operationally possible) to help your body resynchronize. Bright lights can improve nighttime alertness and performance

2. **Countermeasures for Jet Lag**

    a. After travel across four or more time zones, re-adaptation can take from four days to several weeks. Time needed for re-adaptation depends on whether effective coping strategies are implemented soon after arrival to the new time zone

    b. Prior to deployment or travel, it may be possible to pre-adapt to the destination time zone

    c. During travel, shift sleep time to destination time zone, if possible

    d. Upon arrival at the destination, maintain regular wake-up times matching the duty schedule

ENABLING LEARNING OBJECTIVE R

Action:	Identify countermeasures for fatigue during periods of sleep restriction
Conditions:	Given a list
Standards:	In accordance with TC 3-04.94 and Leader's Guide to Crew Endurance

1. **Strategic napping. This is the best fatigue countermeasure**

    a. Even short naps are beneficial. It is best to time naps with the circadian cycle (easiest to fall asleep between 0100-0600 and 1400-1600)

    b. Plan 20-30 minutes to recover from sleep inertia. If you need to minimize grogginess, keep naps less than 45 minutes or at least 1.5-2 hours in length. This improves the chances you won't awaken during short-wave sleep (which would increase your grogginess)

    c. Naps are most effective close to the beginning of the long duty period and early on in the sleep-deprivation period. It is easier to prevent fatigue-induced performance declines than to regain performance abilities

2. **Rest/breaks**. Taking a break in your activity can allow for physiological and mental rest and reduce boredom

3. **Exercise**. Even mild exercise can increase levels of alertness. When you have the opportunity, move around

4. **Postural changes**. Alertness can be improved through our posture. Sitting upright or standing can help alert us when we are fatigued

ENABLING LEARNING OBJECTIVE S

Action:	Identify aeromedical policy for use of medications for fatigue while on flight status
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93 and US Army Aeromedical Policy Letters

1. Aeromedical policy states that all sleep aids and stimulants are Class 4 medications when used for general reasons. This means **sleep medications CANNOT be used long-term** or without the consent of the flight surgeon. The crewmember will be grounded until a waiver is obtained for the condition causing the sleep problems

2. Aeromedical policy gives an exception for Pre-Deployment Rest or Sustained Operations. **Sleep aids and stimulants CAN be used short-term in combat or during exceptional ("fly or die") circumstances when it is operationally necessary**. In these cases, the Flight Surgeon may give crewmembers medications and no waiver is necessary for the crewmember to keep flying, but **this action must be authorized by the local commander**. Any crewmember who demonstrates suspicious symptoms should be immediately grounded until symptoms resolve

3. **Caffeine** enhances alertness but the performance measures are variable

    a. Use of 75-150 mg's of caffeine can increase alertness, postpone fatigue and enhance performance on simple intellectual tasks and physical work that involves endurance but not fine motor coordination (caffeine-induced tremors can decrease hand steadiness)

    b. More than 500-650 mg's of caffeine a day can cause health problems

    c. Aeromedical policy prohibits use of caffeine in pill form. Caffeine in drinks or food is acceptable

    d. Individuals who use caffeine frequently and in high amounts adapt to it and subsequently lose the alerting affect

WARNING: Read labels to know how much caffeine you are consuming.

NOTE: If you have problems sleeping at night, stop using caffeine early in the evening

ENABLING LEARNING OBJECTIVE T

Action:	Identify leadership actions for support and implementation of a fatigue management program
Conditions:	Given a list
Standards:	In accordance with TC 3-04.93 and Fatigue in Aviation

WARNING: Leaders need to recognize that fatigue is a real safety and performance issue. Crewmembers CANNOT simply train more to reduce the effects of fatigue. They must get appropriate amounts of sleep to be at peak levels of performance and alertness

NOTE: Studies have demonstrated that performance after 17 hours of sustained wakefulness is equivalent to performance impairment associated with a 0.05% Blood Alcohol Content (BAC). Studies have demonstrated that performance after 24 hours of sustained wakefulness is equivalent to impairment associated with a 0.10% BAC

1. **Leaders should be aware of the level of fatigue in their crewmembers**. Monitor crews for signs of fatigue and allow them to use appropriate countermeasures whenever possible

2. **Design work schedules** with sleep requirements in mind. Amount of time off is not equal to the amount of time asleep. Allow for enough time off so that crews are not having to sacrifice sleep for other necessary activities

3. **Limit the duration of sleep restriction** as much as possible. When sleep restriction and fatigue is unavoidable, limit strenuous mental tasks when possible to decrease the chance for error and accidents

4. **Modify work-load demands** and/or staffing ratios during late night and pre-dawn hours to improve safety. If a night task is more demanding, this may mean increasing the number of people to decrease the amount of demand on any one person

5. **For the night shift crews**

    a. **Do NOT make them stay long at the end of their shift** for briefings or other duties

    b. **Rotate schedules forward** to minimize the time it takes for circadian readjustment

6. **For split shifts (12 hour shifts), schedule the crew's time-off for periods where it is naturally easier to obtain sleep (early afternoon and middle of night)**

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